

Reducing Emissions from Your School Bus Fleet

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July 16, 2003



Overview

- Diesel engines and emissions
- Emissions standards
- Clean fuels
- Clean technology
- Fuel and technology for your fleet

Pollutants emitted

- Hydrocarbons
 - Nitrogen oxides
 - Carbon monoxide
-

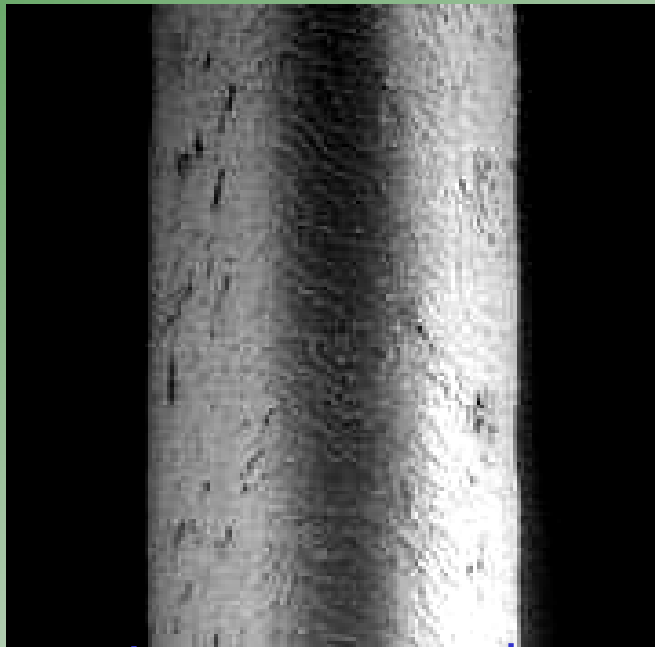
= Ozone and regional pollution

- Particulate matter (PM)

=respiratory hazard/main health concern

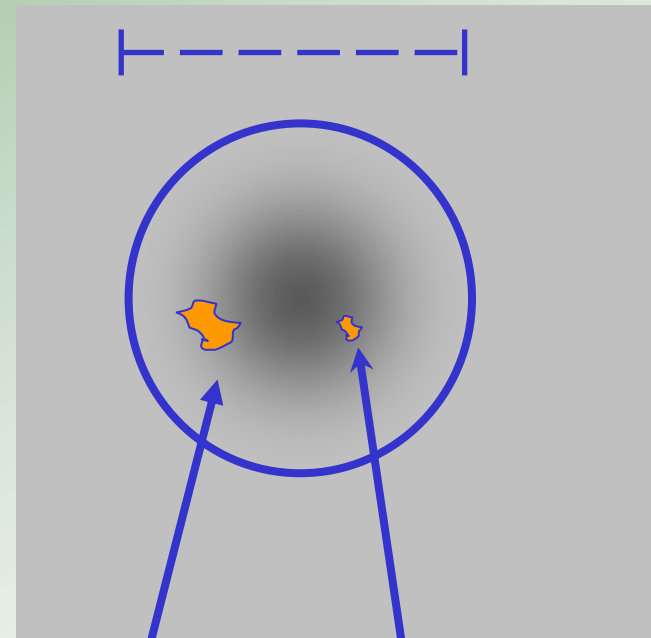
Particulate Matter: What is it?

- A complex mixture of extremely small particles and liquid droplets



Human Hair (70 μm diameter)

Hair cross section (70 μm)



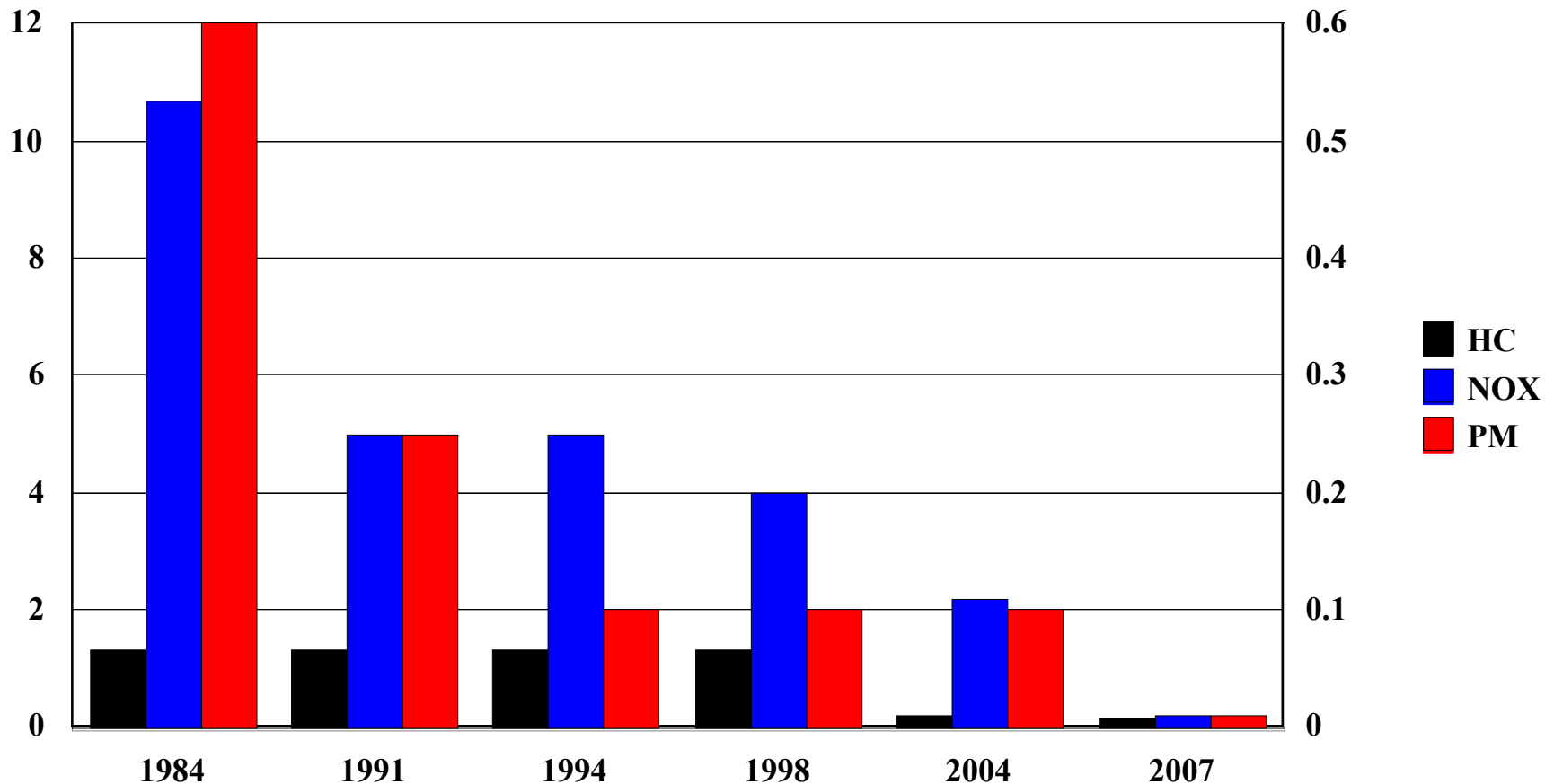
PM₁₀
(10 μm)

PM_{2.5}
(2.5 μm)

Diesel Engine Emission Standards

- EPA is aware of these human health concerns
- Progressively passed emission standards
- Latest phased in between 2004 - 2007
- 90% reduction in PM
- 90% reduction in diesel fuel sulfur by 2006

EPA's Emission Standards for Trucks and Buses



Your Vehicles Aren't Affected

- New standards only affect new engines
- In-use vehicles aren't *required* to make improvements

A Note on Inspections

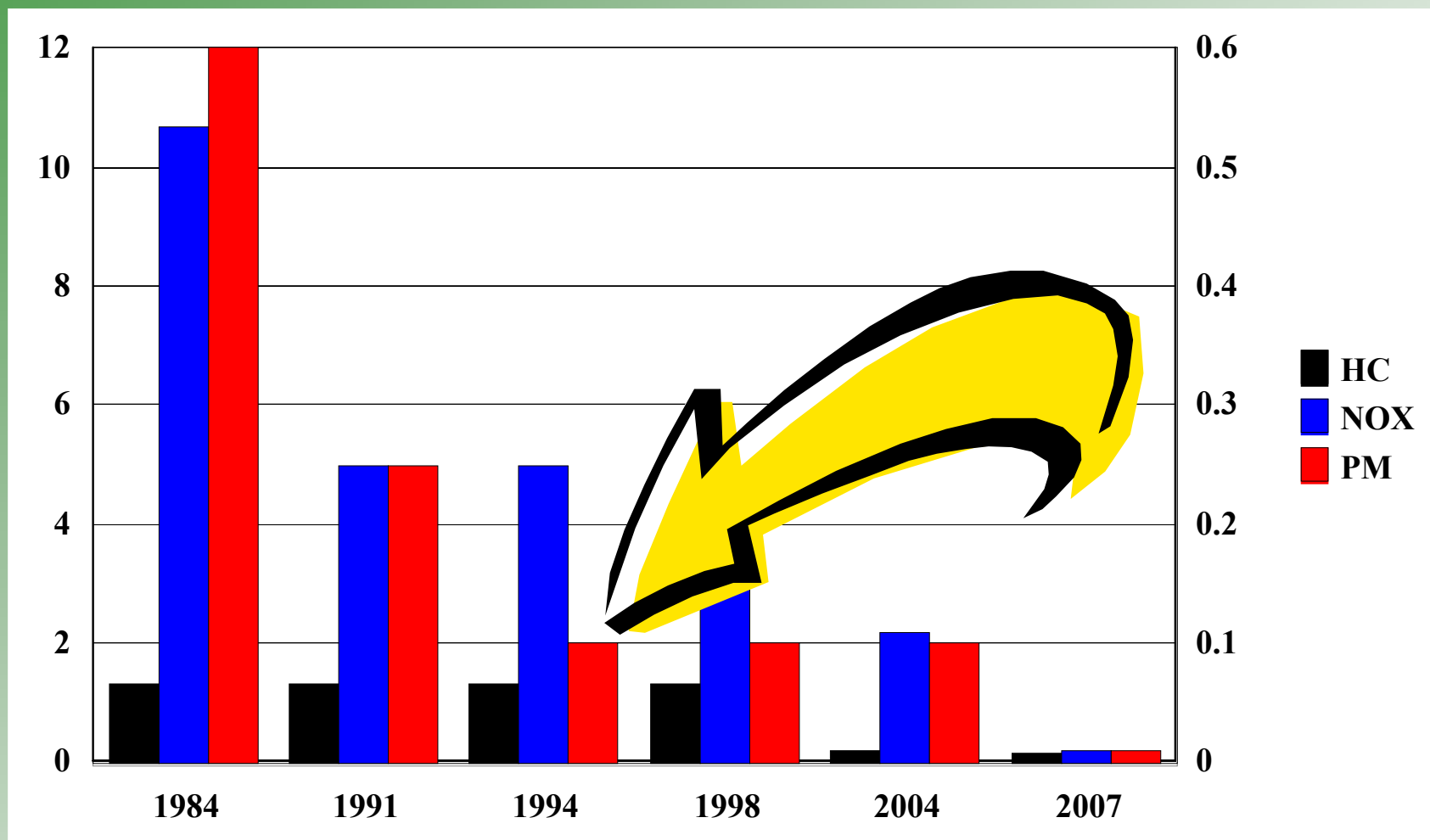
- Opacity tests aren't the same as diesel engine standards
 - Vehicle inspections are state-mandated
 - Engine emission standards are Federally-mandated

The Bottom Line:

New standards don't change your regular inspection requirements

For Example:

A 1994 bus only has to meet 1994
emission standards



What can you do to clean your school bus fleet emissions?

- Diesel buses last a long time
 - Emissions will be high until vehicles retired
 - Or...

You can apply technology to reduce emissions

- Clean fuel

- Reduces emissions before they start

- Aftertreatment (retrofit)

- Reduces emissions in tailpipe

Cleaner fuel

- Ultra-low sulfur diesel
- Biodiesel
- Compressed natural gas

Cleaner fuel

■ Ultra-low sulfur diesel

- Biodiesel
- Compressed natural gas



- Will be standard diesel in 2006
- 99% sulfur removed
- 10-20 cents more per gallon
- 5% particulate reduction

Cleaner fuel

■ Ultra-low sulfur diesel


• Biodiesel

■ Compressed natural gas



- Domestically produced, soy-based renewable fuel
 - safe and biodegradable
- 5-10 cents more per gallon
- 10% particulate reduction

Cleaner fuel

- Ultra-low sulfur diesel
 - Biodiesel
 - Compressed natural gas
- 
- Requires engine modification or replacement
 - Requires fueling infrastructure
 - Plus associated costs
 - 90% PM reduction

Aftertreatment

- Diesel oxidation catalyst
- Diesel particulate filter



Aftertreatment (retrofit)

- Diesel oxidation catalyst
 - Chemically changes emissions
 - No maintenance
 - \$1,000-2000 per device
 - 10-40% PM reduction
- Diesel particulate filter

Aftertreatment

- Diesel oxidation catalyst

- Diesel particulate filter



- Physically filters exhaust
 - minor maintenance
- Requires high tailpipe temperature
- \$6000-10,000 per device
- 80-95% PM reduction

Differences

Oxidation Catalyst

\$\$ -

No maintenance -

“plug and go” -

Moderate -
PM reduction

Particulate Filter

– \$\$\$\$\$

– Minor maintenance

– Tailpipe temperature
must be high

– Requires ULSD

– Very high PM
reduction

Other Ways to Reduce Emissions

- Proper maintenance
- Anti-idling
 - Practices
 - Bus cabin heaters
- Fuel additives
- Crankcase emission reduction devices

Choices for Vehicles in Your Fleet

Pre- 1994

- Oxidation catalyst
 - Can use ULSD or Biodiesel

1994 and newer

- Oxidation catalyst
 - Can use ULSD or Biodiesel
- or
- Particulate filter
 - Must use ULSD

Any Vehicle Ready for Retirement

- ☐ Compressed natural gas
- ☐ Any of above options

Other ways to reduce emissions:

- Clean emissions start with proper maintenance
- Reducing idling can reduce total emissions
 - No aftertreatment device can reduce crankcase emissions
- Crankcase emission reduction technology

Assistance

- EPA Region 2 can help with technology transfer
 - Outreach and training materials
-
- Clean School Bus USA
 - \$5 million available from EPA Headquarters
 - Pending supplemental environmental project award
 - \$20 million available from violator

Summary

- New standards are coming on-line
- You can reduce your fleet's emissions now
- Options depend on your fleet's characteristics
- Technical and monetary assistance is available

For Further Information...

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www.epa.gov/otaq/retrofit